

PURWANCHAL UNIVERSITY

VII SEMESTER FINAL EXAMINATION-2004

LEVEL : B. E. (Electronics & communication)

SUBJECT: BEG430EC, Antenna and Propagation.

Full Marks: 80

Pass marks: 32

TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1]** [a] Explain the different layers in atmosphere. How ionospheric propagation occurs? Discuss. [8]
[b] What does “Skip Distance” and “Skip Zone” means in wave propagation? Explain the tropospheric scatter propagation of EM wave. At which frequency band it is important. [8]
- Q. [2]** [a] Show that the transmission loss increases with the increase in operating frequency. [8]
[b] In a satellite communication systems, free space condition may be assumed. The satellite is at a height of 36000Km above earth, the frequency used is 4 GHz, the transmitting antenna gain is 15dB and the receiving antenna gain is 45dB. Calculate [i] free space transmission loss. [ii] received power when the transmitted power is 200 watt. [8]
- Q. [3]** [a] Define antenna and explain its basic parameters. [8]
[b] Explain the construction of log periodic array with its characteristics and mention the advantage of it over Yagi-Uda antenna. [8]
- Q. [4]** [a] you are assigned a task by a upcoming television company to select a proper antenna for terrestrial transmission of its TV program in a city. The company has license to use broadcast channel no 10 of frequency

193.25 MHz and it plans to keep antenna in the center of the city. Suggest the proper antenna to the company for the transmission within the reason why the company should use that antenna. Which antenna should be preferred for receiving the transmitted signal to outside the city and why? [5]

[b] How EM wave propagate through a dielectric medium. Explain. [5]

[c] Calculate the maximum usable frequency if electron density of ionosphere is 1.2×10^{12} electrons/m³ and the angle of incident is 40°. [5]

Q. [5] [a] Define acceptance angle and numerical aperture. List the advantages of optical fiber over metallic wire. [9]

[b] Explain the Fresnel diffraction at a knife-edge. [7]

Q. [6] [a] If you want to make point to point communication from your university at Biratnagar to Dhaka University, at Dhaka, Bangladesh, which frequency band and antenna do you select? Justify your answer. [5]

[b] Explain the thevenin's superposition and maximum power transfer theorem of Antenna. [9]

[c] Define Signal to noise ratio. [2]

PURWANCHAL UNIVERSITY
VII SEMESTER BACK-PAPER EXAMINATION-2004
LEVEL : B. E. (Electronics & communication)
SUBJECT: BEG430EC, Antenna and Propagation.

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Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a]** What is retarded potential? How EM waves propagate through Lossy medium? . [2+6]
[b] Define radiation pattern. Derive the electric and magnetic field components in Fraunhofer field for infinitesimal dipole. . [2+6]
- Q. [2] [a]** What is antenna array and why it is needed? Explain End-fire antenna array. [3+5]
[b] A high-frequency radio-link has to be established between two points at a distance of 2500 km. Considering ionospheric height to be 200Km and critical frequency 5 Mhz. Calculate MUF. [8]
- Q. [3] [a]** Differentiate beamwidth and bandwidth of antenna. Derive friss transmission equation for free space propagation. [8]
[b] Explain Thevenin's, maximum power transfer and compensation theorem for antennas. [8]
- Q. [4] [a]** Explain tropospheric wave propagation. [5]
[b] Define critical frequency and maximum usable frequency. [5]
[c] Find the range of line of sight when the receiving and transmitting antenna heights are 10m and 100m. Take the effective earth radius into consideration. [5]

- Q. [5] [a]** Derive numerical aperture for meridional rays in optical fibers. [6]
[b] Calculate the directivity of an antenna whose radiation intensity is $\phi = 4\sin^2\theta$ [5]
[c] How graded index fiber differ from step index fiber? [5]
- Q. [6] [a]** Calculate power radiated by $\lambda/16$ dipole in free space if it carries a uniform current of $i(t) = 100\cos\omega t$. What is radiation resistance? [2+2]
[b] Write a short notes on (any THREE): [4×3=12]
(i) Aperture Antenna.
(ii) Plane Earth Propagation.
(iii) Poynting Vector.
(iv) Effective Area of Antennas.

PURWANCHAL UNIVERSITY

VII SEMESTER FINAL EXAMINATION-2005

LEVEL : B. E. (Electronics & communication)

SUBJECT: BEG430EC, Antenna and Propagation.

Full Marks: 80

Pass marks: 32

TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1]** [a] What are the Antenna Theorems and how are they used in antenna? [8]
[b] Calculate the r.m.s current required in a 1cm long Hertzian dipole antenna to radiate 1 w of power at a frequency of 300MHz, where $\lambda_o = 1\text{m}$. [4]
[c] What is Retarded vector potential? Show the relationship between retarded current and retarded vector potential of the electric current for a short dipole. [4]
- Q. [2]** [a] Differentiate between end-fire and broad side arrays along with their radiation pattern. [8]
[b] Define power gain and directive gain of an antenna and relate the power gain to the directive gain. [4]
[c] Why is antenna array used? Differentiate between parabolic dish antenna and Horn Antenna. [4]
- Q. [3]** [a] Derive the expression for transmission loss of two distance station. [8]
[b] A receiving system has an antenna with a total noise temperature of 50K, a physical temperature of 300K and an efficiency of 99%, a transmission line at a physical temperature 300K and efficiency of 90%, and a receiver with the First 3 stages all of 80K noise

temperature and 13dB gain. Find the system temperature. [8]

- Q. [4]** [a] In a multimode fiber, a beam of light energy experiences a total phase shift of 3080 radians. Determine the number of guided modes in this fiber. [8]
[b] Describe any three advantages of optical fibers as a transmission medium. Define the range of frequencies and wavelengths that are suitable for fiber optic transmission. [5]
[c] Cladding is not necessary for light to propagate along the fiber. Why? [3]
- Q. [5]** [a] What is tropospheric Scattering. Explain. [5]
[b] Find the MUF for a distance $d = 1.3 \text{ Mm}$ by F2 – layer ($h = 325\text{km}$) refraction with F₂-layer electron density $N = 6 \times 10^{11} \text{ m}^{-3}$. Neglect Earth Curvature. [5]
[c] Explain atmospheric bending. Explain refractivity chart. [6]
- Q. [6]** **Write a short notes on (any FOUR):** [4×4=16]
(a) Snell's Law
(b) Ionograms.
(c) Fresnel Diffraction.
(d) Signal to Noise Ratio in Antenna.
(e) Irregular Variation of Ionosphere.

PURWANCHAL UNIVERSITY

VII SEMESTER BACK-PAPER EXAMINATION-2005

LEVEL : B. E. (Electronics & communication)

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Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

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Attempt ALL questions.

[10×8=80]

- Q. [1] Define an electric dipole. Find the electric field **E** due to a **Z** direction static electric dipole in free space.
- Q. [2] What is basic antenna parameter? Explain in detail about antenna gain with required derivation.
- Q. [3] Explain the effect of earth's magnetic field in sky wave propagation.
- Q. [4] Prove that the effective length of antenna is same in transmitting and receiving case.
- Q. [5] Mention the direction property of an aperture antenna. How can you reduce the intensity of side lobes?
- Q. [6] What is horn antenna? How is it fed? Explain its applications.
- Q. [7] Show that for any aperture antenna the ratio of directivity to the effective aperture area is constant. Obtain the value of the constant.
- Q. [8] Explain detail principle of Yagi-Uda Antenna.
- Q. [9] Explain noise and static in radio wave communication and means of overcoming static.
- Q. [10] **Write short notes on:**
[a] Acceptable angle and numerical aperture.

[b] Micro wave propagation.

PURWANCHAL UNIVERSITY
VII SEMESTER FINAL EXAMINATION-2006
LEVEL : B. E. (Electronics & communication)
SUBJECT: BEG430EC, Antenna and Propagation.

Full Marks: 80
Pass marks: 32
TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a]** Define antenna. Write antenna theorem for Thevenin's Maximum power transfer and superposition. [2+6]
[b] What is Poynting Vector ? Explain how EM travels through a perfect dielectric. [3+5]
- Q. [2] [a]** How would you differ Rhombic antenna from V-antenna? Define Long wire linear antenna with its important characteristics. [2+3+3]
[b] Define antenna array. Explain its importance. Describe in brief about any one linear arrays used in communication. [2+3+3]
- Q. [3] [a]** Explain the Fresnel diffraction at a knife edge. [8]
[b] Suppose the distance between Biratnagar Nepal Telecom switching centre to Birgung Nepal Telecom switching center is 400Km. The link between these two centre is through microwave communication which is being operated at a frequency of 3GHz. The diameter of the receiver (Rx) and Transmitter (Tx) parabolic antennae are correspondingly 1.7m and 1.5m. [4+4]
- Determine:**
(i) Free Space transmission loss in dB.
(ii) Actual transmission loss in dB.
(iii) The antenna constant (K) is 0.55.

- Q. [4] [a]** Define free electron density of a layer. Explain the mechanism of tropospheric scatter propagation. [3+6]
[b] Write down the secant law for Maximum usable frequency. Calculate the maximum usable frequency if the electron density of the ionosphere is 1.2×10^{12} electrons/m³ and the angle of incidence is 40°. [2+6]
- Q. [5] [a]** Describe the various blocks of optical fiber Communication system. [8]
[b] What is aperture antenna? Why it is used? What are the types of aperture antenna? [2+3+3]
- Q. [6]** The head office of Creative Net Sanchar if in Kathmandu and its branch office is in Biratnagar if a link or communication is to be done between these two offices, which type of communication would you suggest? Explain your suggestion with the frequency band and antenna type. [4]
- Q. [7] [a]** Write short notes on: [any THREE] [3×4=12]
(i) Number of modes in optical fiber.
(ii) Radiation pattern.
(iii) Yagi Array.
(iv) Electron density profile of ionosphere.

PURWANCHAL UNIVERSITY

VII SEMESTER FINAL EXAMINATION-2007

LEVEL : B. E. (Electronics & communication)

SUBJECT: BEG430EC, Antenna and Propagation.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a]** What is Poynting vector? How E.M waves propagate in a perfect dielectric? [2+6]
[b] Define Antenna. What are the types of antenna? Explain them in brief. [2+6]
- Q. [2] [a]** Define traveling wave antenna. Explain its type in brief. [3+6]
[b] What is antenna array and why it is needed? Explain broadside array. [4+3]
- Q. [3] [a]** What are the directional properties of dipole antenna? Derive knife edge equation for free space propagation. [3+5]
[b] Define transmission loss. How can you show that transmission loss increases with the increase in operating frequency? [8]
- Q. [4] [a]** Why VHF is returned back to the earth's surface in tropospheric scatter propagation? Explain [8]
[b] In a satellite Communication system, free space condition may be assumed. The satellite is at a height of 36000km above earth, the frequency used is 4GHz, the transmitting antenna gain is 14dB and the receiving antenna gain 45dB. Calculate [2+6]
[i] Free Space transmission loss.

[ii] received power when the transmitted power is 200W.

- Q. [5] [a]** Explain the basic block diagram of optical fiber communication system. [8]
[b] Why optical fibers are more superior than copper wires? Explain [8]
- Q. [6] [a]** A high frequency radio link has to be established between two points a distance of 2500KM. Considering ionospheric height to be 200KM and Critical frequency 5MHz. Calculate MUF. [8]
- Q. [7] [a] Write short notes on: [any TWO] [4×2=8]**
(i) Aperture Antennas.
(ii) Spontaneous and Stimulated emission.
(iii) Radiation pattern lobe.

PURWANCHAL UNIVERSITY
VII SEMESTER FINAL EXAMINATION-2008
LEVEL : B. E. (Electronics & communication)
SUBJECT: BEG430EC, Antenna and Propagation.

Full Marks: 80
Pass marks: 32
TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt FIVE questions.

- Q. [1] [a]** Derive the expression for radiation resistance with the help of equation $E_{\theta s} = \eta H_{\phi s}$ and also explain the current distribution pattern of dipole antenna. [5+3]
[b] Define antenna. What are the conditions for radiation? Explain its basic parameters. [1+2+5]
- Q. [2] [a]** In what manners traveling wave antenna is superior to a standing wave antenna. Explain in brief the types of traveling wave antenna. [2+6]
[b] Why an antenna array is required? Derive a relation for the field intensity for the array of two element isotropic radiators and give one example. [2+5+1]
- Q. [3] [a]** Explain with suitable pattern why the separation between the adjacent elements of a broadside array cannot be equal to the integer multiple of the wavelength. [8]
[b] A television company uses a terrestrial antenna for transmission of its TV programme in a city. The company has a license to use broadcast channel 25 of audio frequency 506.5Mhz and video (image) frequency 502 Mhz. Now you are asked to design a proper Yagi Uda antenna for that transmission frequency. Also draw its radiation pattern. [7+1]

- Q. [4] [a]** What do you mean by radio waves? With a clear sketch explain the designation of radio waves according to the path they have taken during propagation. [2+6]
[b] A $\lambda/2$ transmitting antenna radiates 10kw of power at 100 Mhz. If the height of the transmitting and receiving antennas are 100 m and 9m respectively. Calculate the Radio horizon range in kilometer. [4]
[c] A plane electromagnetic wave is propagating at a frequency of 20Mhz into an ionized but otherwise field free medium. The electron density increases in the direction of propagation. If the positive ions are regarded as effectively insoluble, determine the electron density at which the phase velocity of wave tend to infinity. [4]
- Q. [5] [a]** Define and illustrate “skip distance” and “skip zone” in wave propagation? Explain the tropospheric scatter propagation of EM wave. At which frequency band it is important. [3+4+1]
[b] What do you understand by optical fiber? Explain the different types of optical fiber with its advantages and disadvantages.
- Q. [6] [a]** If the maximum density in the ionosphere corresponds to a refractive index of 0.82 for a frequency of 10Mhz. Determine, neglecting the effect of earth’s magnetic field, the ground range for which this frequency is the maximum usable frequency (MUF). Assume that the reflection takes place at a height of 300Km and the earth is a flat surface. [8]
[b] Write short notes on: [any TWO] [2×4=8]
(i) Detector in optical fiber communication.
(ii) Retarded vector potential
(iii) Microwave propagation.

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VII SEMESTER BACK-PAPER EXAMINATION-2008

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Full Marks: 80

Pass marks: 32

TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Attempt FIVE questions.

- Q. [1] [a]** Define Antenna. What are the types of Antenna? Explain them in brief. [2+6]
[b] Derive an equation for a power radiated by a current element. Also find the input impedance of longer antennas. [5+3]
- Q. [2] [a]** How standing wave linear antenna differs for the traveling wave linear antenna? Explain [8]
[b] Define side lobe ratio. What is antenna array and why it is needed? [1+7]
- Q. [3] [a]** What are aperture antennas? Contrast between Yagi-Uda and log periodic array. [3+5]
[b] Why VHF is returned back to the earth's surface in tropospheric scatter propagation? Explain. [8]
- Q. [4] [a]** Derive an expression for the transmission loss between antennas. Also show the relationship between antenna temperature and signal to noise ratio. [5+3]
[b] It is required to estimate the transmission losses of a 24 hours fixed microwave relay for 36000 KM path, 30m diameter antenna on the satellite are used and their effective areas are 0.65 times the actual areas. The ground to satellite link and satellite to ground link are established at respectively 3 GHz and 6 GHz. [8]

- Q. [5] [a]** Ionosphere is composed of different layers. Explain those layers and give your view for the existence of those layers with reference to free electron density. [8]
[b] Derive a formula for VHF propagation in ionospheric waves. [8]
- Q. [6] [a]** Derive an equation for Snell's law. What are the merits and demerits seen in optical fiber? [3+5]
[b] Write short notes on (any TWO): [2×4=8]
(i) MUF and LUF
(ii) Directional properties of dipole antenna.
(iii) Avalanche photodiodes.

